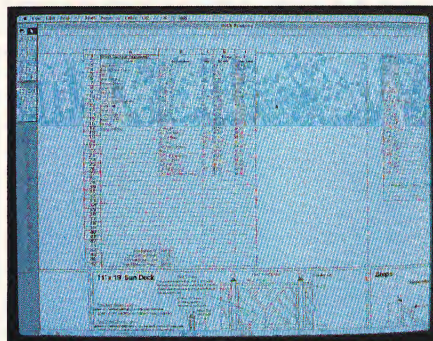
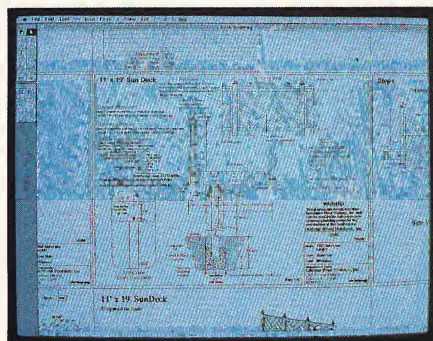
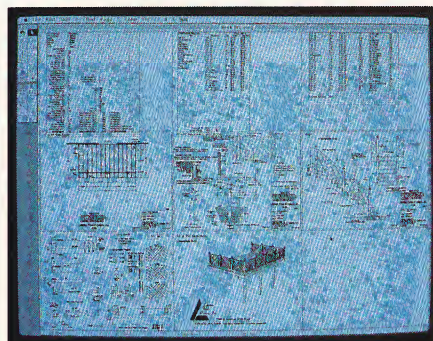
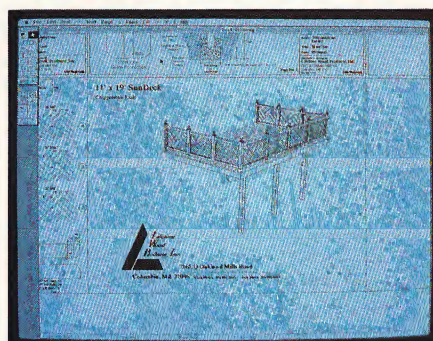


BUILDING UNDER THE SUN WITH CAD



From top: Sun Deck drawing with Chippendale Rails; a summary of drawings; automating the production of sun decks has boosted Lifetime Wood Product's competitive edge; Minicad+ offers the ability to automate many functions with macros. The macro generates a bill of material by associating a part number and description for every component entered into the drawing.

by Susan Gawler

John Pacylowski, president of Lifetime Wood Products, Inc. (Columbia, Maryland), has more time to bask in the sun these days. By writing a CAD routine to perform much of his design work for the sun decks his company manufactures, he has reduced a typical one- to two-day manual drafting job to a matter of minutes. The routine, or macro, that Pacylowski uses automatically generates the drawing required for the county building agency, as well as the drawing needed in the company's shop to cut and partially assemble the product. It adjusts for various building code requirements, tests for and eliminates interference between elements, and provides a bill of material.

Pacylowski uses the routine in Minicad+ from Graphsoft in Ellicott City, Maryland that automates the production of sun decks. By precutting and partially assembling deck components in the plant, Lifetime significantly reduces the time it takes to install a deck. "This business is very production oriented," Pacylowski said. "Builders want the carpenters to do their job and be out of the way fast, so they appreciate our speed. Now with the CAD package, we can further increase our production rate. Not only can I produce the drawings faster, I can make design changes quickly and test them fast onscreen."

For each deck project, Pacylowski must produce two or three sets of drawings. The first, the "original drawing" rendered as a cross section, contains all the information for building permits, such as joist spans, placement of the posts, weight capacities between posts, size of the footings, the size and number of bolts, and size of nails. The drawing also indicates live loads and dead loads and footing capabilities and requirements. "Each county has its unique requirements," Pacylowski pointed out. "We have one county that says the distance between the pickets on the railing must be no more than six inches; another says no more than four."

The next drawing is for the benefit of shop staff. It shows all the cuts of all the pieces, along with the exact measurements of each piece, and indicates where to preplace joist hangers on the plate and other placements. A third drawing, only occasionally used, guides the carpenters in the field for assembly.

If the design changes (such as a Chippendale railing being requested at the last moment over a standard railing), everything must be redrawn. "That can be

a nightmare," Pacylowski said. "To prevent that, we always tried to use standard items so they could be used over and over without redrawing."

In developing a new deck design, Pacylowski had to build the model in the shop first because he needed to see what it looked like and to detect any weaknesses or interference.

THE MOVE TO CAD

With all the time spent in drawing and building prototypes, Pacylowski knew his business needed the reported advantages of a CAD system. His first experience with one, though, was disappointing. "When MacDraft came out, I began using it on the Macintosh. I had a considerable timesavings." However, he said, programs like MacDraft were only useful as drawing aids. All necessary calculations still needed to be done prior to drawing. He then used a 3D package called MacPerspective. Although it was a good wireframe 3D package, he says, it didn't offer the accurate dimensions he needed, and he couldn't reuse much of the information from the drawing to generate the shop drawings. Pacylowski said MiniCad+'s ability to automate many of his functions with macros, accurate dimensioning, 3D views, and ease of use convinced him it would offer the productivity gain he was looking for.

The first steps in Pacylowski's macro involve inputting the deck's size and other information into a spreadsheet. A MiniCad+ spreadsheet, which is integrated into the CAD package, can be called into the drawing, placed on it as a graphic, used as a scratch-pad calculator, or left in the drawing for specifications and accounting lists. In this case, Pacylowski uses it for specifications and accounting. In the spreadsheet, many of the default settings, such as the maximum joist span and location of the head-beam placement, are already in place. Pacylowski has highlighted items he is to input for each drawing, such as the size and type of lumber requested, the builder, and the size of the deck. The highlights help ensure that Pacylowski or any other person entering the data inputs all the needed information.

After completing the spreadsheet, Pacylowski runs the macro, which produces a complete set of engineered drawings, then pulls the dimensions and all the information off the screen to make the shop drawing.

Besides generating the drawings, the macro also frees Pacylowski from calculating the number and spacing of joists

and posts. After he enters the required minimum distance that the joists must span, the macro calculates the number of joists that will be needed and the distance that should be between them to make them equally spaced. "That's especially handy to comply with the different counties' specifications," he said. Similarly, the macro calculates the placing of 4" x 4" support posts. What's more, the macro can also detect interference between a joist and a post, and solve the problem by adding another post and adjusting the distance between posts. "This feature in particular has saved me a tremendous amount of time," Pacylowski said. "I used to have to redraw, move a post or joist, and then calculate everything all over again."

The macro also generates a bill of material by associating a part number and description for every component he enters into the drawing. "The bill of material is a complete listing of all the raw materials I need, the sizes, quantities, and costs, along with subtotals for each type and total costs," he explained. This textual information exists in a MiniCad+ master file. After completing the drawing, the information remains linked to the components. As changes are made to the drawing, the textual database can be automatically updated. The macro also computes the total weight of the package, so the shop knows how much weight is being put on the truck, and gives an exact cost quote in minutes, which helps Pacylowski in his day-to-day sales efforts.

DRAWING BY HAND

Although the macro automates many of his drawing tasks, Pacylowski still does a number of drawings freehand. For these, MiniCad+ provides timesavings with a number of drawing aids.

"When I get a request to add a hot tub to a design," he said, "the macro is not capable of making that kind of change yet, so I draw the tub freehand. That's the case with gazebos, too. I struck up a deal with a local manufacturer to use gazebos with my product. He didn't have a single drawing to take to the county agencies because he's never had to deal with the agencies, so I had to reproduce those gazebos on the screen and get all the dimensioning that the county would need. It only took me about two hours. As another example, MiniCad+ also came in quite handy when we moved into a new office space. I used it to help rearrange the furniture. It's also helped to efficiently store the lumber in the warehouse."

A major drawing aid is MiniCad+'s libraries, which are collections of frequently appearing components that Pacylowski can reuse instead of having to redraw. The hierarchical graphic symbol library organizes the symbols in Macintosh-style folders according to type of symbol, such as railings or posts. "That greatly simplified the symbol selection process. With the hundreds of symbols I've collected, it would have been difficult to remember symbol names," said Pacylowski.

Layers are an additional drawing aid, he said, referring to the several possible layers in a MiniCad+ drawing, which are like celluloid overlays. For ease of visualization, layers can be invisible or filled with gray, and each can have its own shading, filling or scale, be locked, and be active. The package can also link graphic objects together into classes, which helps to move or hide them. "This feature goes far beyond the layering concept found in most CAD packages," Pacylowski said. "With conventional CAD packages, this is usually accomplished by classes in separate layers. But this makes it difficult to position items. To do it accurately, you have to jump back and forth between layers."

Much of Pacylowski's work is in 2D, but he also benefits from the 3D feature, which primarily helps him see how items fit together. He said the integrated 3D makes it easy to extrude several objects in the drawing at once, automatically snap them together, and view them at any angle, either as wireframes or as shaded solids. While working in 2D, Pacylowski can have 3D objects present at the same time, on the same layer. This speeds work and can even solve disputes. "It was difficult sometimes to explain to a client that the placement of the deck was in conflict with fireplaces, windows, and doors of the house," he said. "I FAXed him a solid 3D object drawing and he was able to see my point."

"MiniCad+ has not only given me a substantial timesavings in producing drawings, but it adds efficiency to exploring new designs," Pacylowski concluded. "In many areas of my business, I've managed to use this CAD package for improvement. I can't imagine how much more it can do, but I think I'm only touching the tip of the iceberg." ■

Susan Gawler, vice president of Lifetime Wood Products, Inc. in Columbia, Maryland, coordinates projects in administration, marketing, and production.

AS SEEN IN
MacWEEK

MiniCad+ 3.0 an excellent value

ON BALANCE

MiniCad+ 3.0 v2

Diehl Graphsoft Inc.
List price: \$795



MiniCad+ provides high value for the price. It has a smart cursor for identifying snaps on the fly; it is accurate, with fast redraw and a programming language; and it has a built-in linked database and spreadsheet. Unfortunately, only one view of a 3-D object is possible.

By Timothy E. Johnson

The latest version of MiniCad+ is the CAD sleeper of the industry. While most other Macintosh CAD programs just concentrate on graphical editing, MiniCad+ comprehensively addresses both 2-D and 3-D drawing and information management. Diehl Graphsoft Inc. bills the new MiniCad+ as an analysis program, and well it should.

The new data palette automatically builds two-way links between typed-in data and selected drawing elements. Procedures defined with the built-in spreadsheets or written with the internal Pascal-like programming language also have access to these links. The combination opens the door to facilities management, parts-list production, report generation, and all fields in which costs and data are tracked and analyzed.

Designers will find that the new "smart" cursor measurably boosts productivity. Like the intelligent cursor pioneered by Ashlar Inc.'s Vellum, it works by dynamically signaling alignments and snaps.

Nothing artificial added. Contrary to what some companies would have you believe, no artificial intelligence is involved in a smart cursor's behavior. You must explicitly establish candidate datum points for possible alignments by snapping to existing points (see illustration, next page).

The new cursor also snaps into the third dimension, but only while you are using the 3-D polygon tool. You can turn off the smart cursor whenever you prefer a cleaner-looking screen.

Information management. The new data palette is used to associate non-graphical information, such as unit costs, with drawing elements. Analogous elements also can belong to classes you name, independent of their drawing layer. You can control any element's visibility by turning its class name on or off.

(Class names also are used to retrieve items for inclusion in MiniCad+'s built-in spreadsheets.) It is possible to build a relational database with the palette because any object can have more than one set of data.

Any one row in a MiniCad+ spreadsheet can behave like an ordinary spreadsheet row or as a database row that links itself to a specific search criteria using the database produced with the data palette.

Graphsoft has simplified the use of MiniCad+'s built-in programming language. Instead of writing programs, you can now optionally create custom drawing tools and database searches using dialog boxes that put together the language's most commonly used options. Programs created with the language run relatively fast. The adventurous can write programs to alter the database or previously drawn elements based solely on the drawing's graphical or informational context. This is powerful stuff.

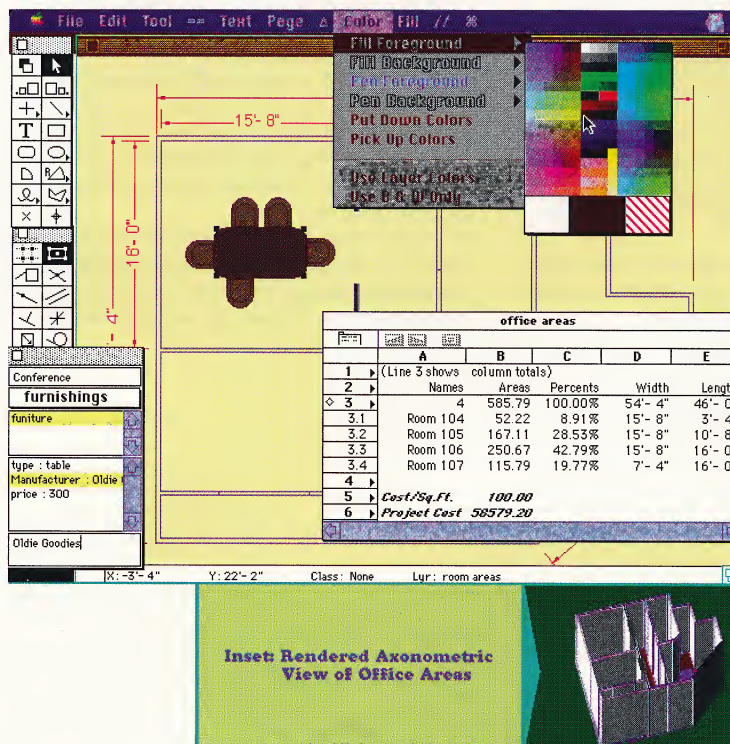
Graphics capabilities. MiniCad+ has most of the drawing features you would expect in a high-end CAD system. You can lay down associative dimensions (which update automatically when the associated object is altered) with one mouse click. Intersections produced with the double-line tool are cleaned up or capped with a nice selection of

trimming tools. You can specify object sizes, angles and positions with the keyboard and perform Boolean operations, such as addition and subtraction, on overlapping objects to form composite shapes.

MiniCad+ does real instantiation, so when you change a symbol master in its library, all instances of the symbol automatically change, even if they are rotated. You can form static copies with an Uncoupling option. For presentations on high-end printers, designers will be happy to know that they can optionally type in line widths as small as 0.001 inch. Fills, unlike the color palette, can be edited.

MiniCad+ is fast. An array of 2,500 rectangles is redrawn in 16 seconds on a color Mac IIcx, which is two seconds faster than MacDraw II's redraw time. One would expect that the integer arithmetic used to achieve this speed would severely reduce accuracy, but a chain-dimensioning test revealed MiniCad+ is accurate to six decimal places. The program has relatively low hardware requirements for a full-featured CAD package, running on a Mac Plus or better with 2 Mbytes of RAM and hard disk.

MiniCad+ has good 3-D capabilities. You also can render a collection of surfaces formed by extruding or revolving 2-D objects in perspective or axonometric projection. A scene is illuminated with a single user-posi-

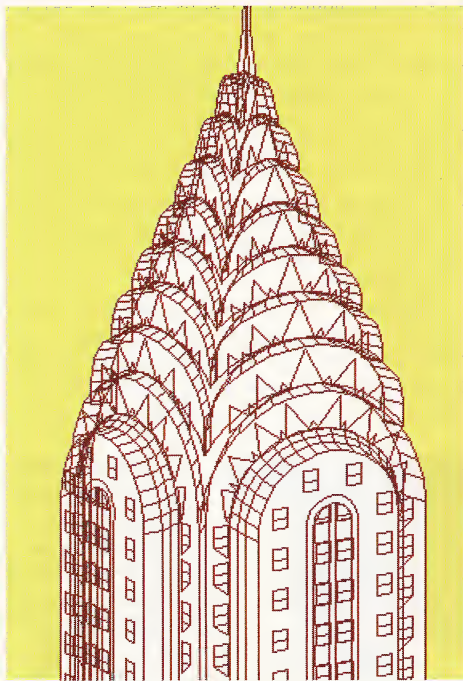


This office-plan drawing shows MiniCad+'s two-way links between drawing elements and data. The data palette at the lower left shows information associated with the selected piece of office furniture. The first scrollable subwindow in this palette lists the object's records. Clicking on a record shows its fields in the next scrollable subwindow. Clicking on a field (in this case, manufacturer) shows its contents at the bottom of the palette. The office-area window shows some of MiniCad+'s spreadsheet features, and the rendering below illustrates the program's 3-D capabilities.

tioned light source. Unfortunately, you can easily lose your orientation when drawing in 3-D, since multiple views are not possible.

MiniCad+ can export its 3-D drawings to StrataVision 3d for richer renderings. It also exports files perfectly in Encapsulated PostScript format. The EPS conversion guarantees that a drawing's accuracy is preserved when placed in desktop publishing documents. We found the DXF (Drawing Interchange Format) and PICT imports worked well, except MiniCad+ has trouble positioning and scaling character strings imported from AutoCAD. IGES (Initial Graphic Exchange Specification) imports and exports are not available.

MiniCad+ always has fallen short in its treatment of some rotated 2-D objects, and the new smart cursor calls attention to the problem. Rotated ellipses are automatically converted to polygons, so not only are the perimeter intersections incorrectly computed against linear facets but the smart cursor no longer can find the rotated ellipse's center. Parenthetically, the Filletting tool can produce inside fillets only between lines.



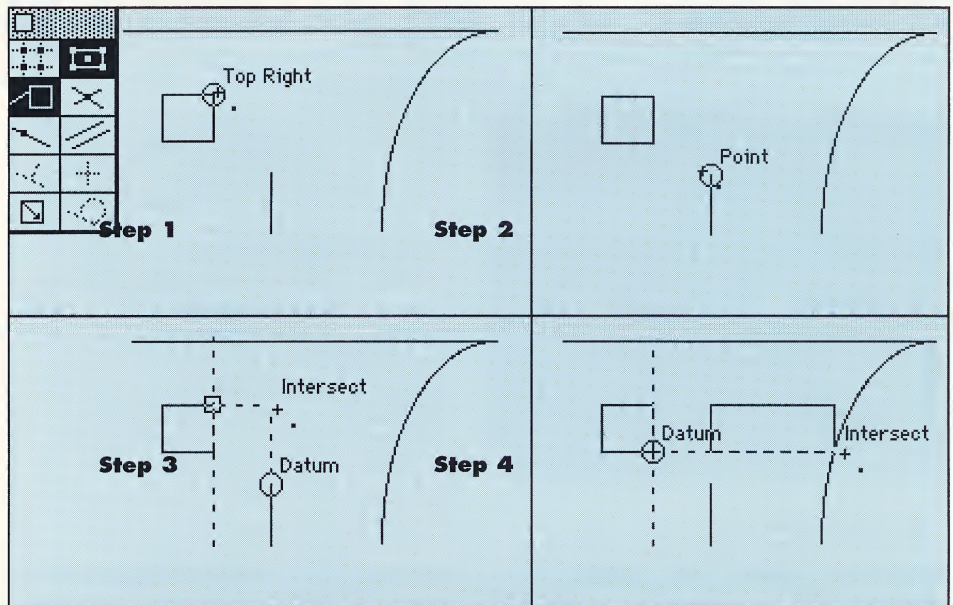
This wireframe view of the Chrysler Building shows some of MiniCad+'s 3-D capabilities. The tower was constructed directly in 3-D with the 3-D Polygon tool.

Conclusions. MiniCad+ 3.0 has few faults and many new analysis features. The latest release is fast and seemingly free of bugs. It has matured into a powerful information manager that vies with CAD systems costing four to five times as much.

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How MiniCad+'s smart cursor works

The four panels above show how MiniCad+'s new cursor can be used to draw an object that aligns with other elements. In this case, we wanted to draw a rectangle that aligns with the top of a square and a point on a line and is adjacent to a curve.

Step 1: First, we defined one of the points of alignment. Here we have selected Snap to Objects and Snap to Sides on the Constraints palette so the cursor will jump either to an object's corner or center or to the nearest point on its side as soon as the cursor is moved into the object's immediate neighborhood. A message called a screen hint appears next to the cursor, indicating what type of point caused the snap. The point is remembered as a reference point if you momentarily suspend mouse movement until a small circle envelops the snapped point, as shown.

Step 2: Now for the second point of alignment. The program checks reference points as you drag the mouse. If you become orthogonally aligned with any of them, the cursor spews out

dotted guidelines to a recorded point. The guideline and screen hint disappear when you pull out of alignment. Here we recorded the second point by pausing at the line until the point hint showed up.

Step 3: Next, we found the starting point for our rectangle by finding the intersection of our two alignment-reference guidelines. The cursor signals a simultaneous alignment with the screen hint called Intersect. Pressing the mouse button while this hint is displayed starts the drawing action.

Step 4: Finally, we finished our rectangle by placing it adjacent to the curve. The cursor flags a simultaneous alignment with a recorded datum point and an unrecorded point on the side of the curve. Releasing the mouse button at this point lays down the aligned rectangle adjacent to the curve.

The smart-cursor action illustrated here is quick and intuitive enough to noticeably increase your drawing speed. — By Timothy E. Johnson